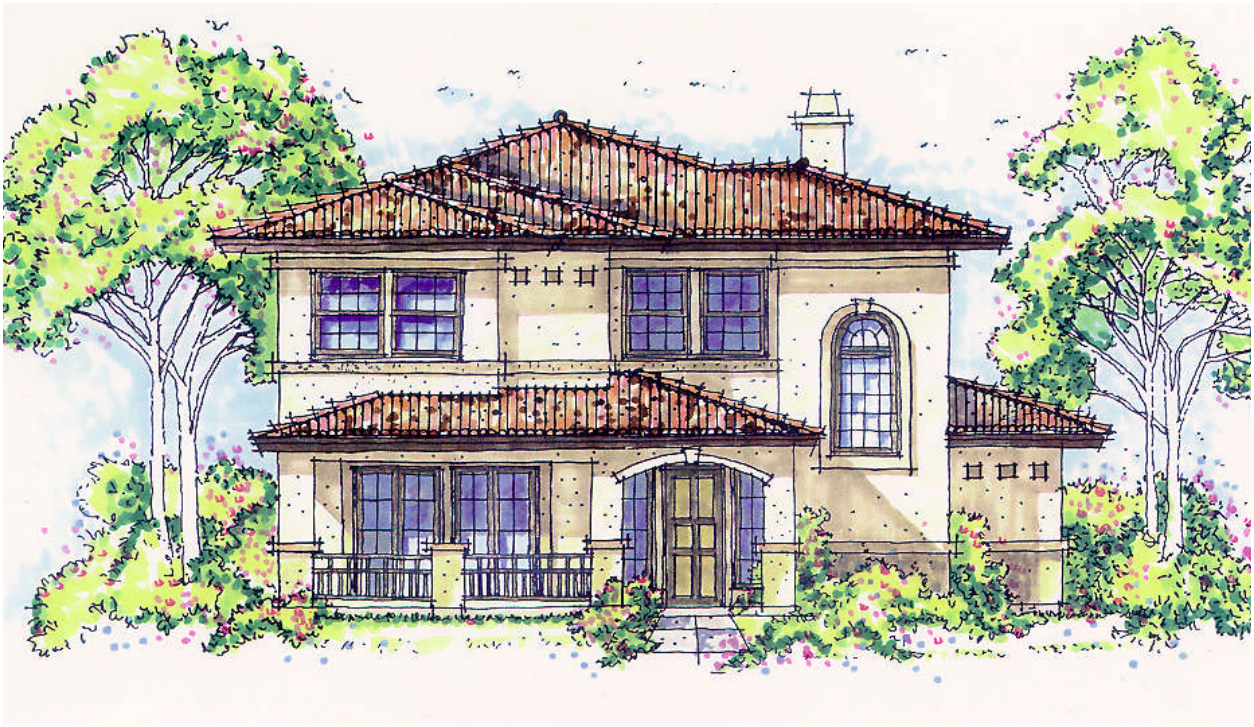
SUMMER PERFORMANCE HOUSES for CALIFORNIA CLIMATES

BUILDER INFORMATION



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Money Isn't All You're Saving

Using Products with the Energy Star label can save energy. Saving energy reduces air pollution and lowers utility bills.

Summer Performance houses can be built to comply with Energy Star ®. To do so, the builder must participate in the program by signing a memorandum of understanding, and following a short procedure. For more information please visit:
http://www.energystar.gov/
and navigate to the home builder's site. Participation in this program may qualify buyers for preferential financing and access to other financial incentives from local utilities such as the PG&E Comforrt home etc.

WHAT IS A SUMMER PERFORMANCE HOUSE ?

Summer Performance Houses are responsive to California residential markets, increase occupant comfort, reduce electrical demand and offer a new marketing approach responsive to environmental and energy concerns.

Production housing is a competitive field. Houses are becoming more sophisticated and offering more and more features. New houses have to be better built, more comfortable and deliver excellent performance. At the same time, California has entered a period of energy instability and skyrocketing prices that will effect homeowners for years to come. The Summer Performance house addresses both aspects of the current situation by offering a high quality home, increased comfort and lower energy use. These are not demonstration houses for extreme low-energy solutions, but rather market-responsive designs which reduce electrical demand by reducing the need for compressive air conditioning.

The Summer Performance design strikes a balance between using a mechanical system and the construction of the house itself to provide comfort for the occupants. The house uses the cool air of a California summer night to prepare for the following day. This is made possible by increasing the quality of the building shell and using a heating-cooling system that ventilates the house with cool night air. Care in the design of cross ventilation, insulation, overhangs for shading and interior materials help reduce the necessity for air conditioning.

These houses will appeal to customers and provide a product that developers can build and sell with reduced risk. The house construction is based on standard industry techniques and materials; concrete slab on grade, wood frame walls, wood truss roof, batt insulation and exterior stucco. Windows and French doors are vinyl frame with low -e glass. Interior options include tile or slate floors on the ground floor to replace carpeting. Industry provided cost estimates confirm that the houses are close to the typical square foot cost assumed by most developers. The houses perform in any orientation, as residential developments seldom match specific design elements with particular lot conditions.

Three prototype Summer Performance House designs ranging from 1,700 to 2,400 square feet are available to residential builders and developers in the State of California: the Two-Story Side Court House, the Single-Story Forecourt House and the Single-Story Compact House. The prototype designs have been developed, through the support of the California Energy Commission and the California Institute for Energy Efficiency by a team of architects, engineers and researchers to offer improved, energy conserving houses to the public.

WHY BUILD A SUMMER PERFORMANCE HOUSE ?

**** Lower energy use*** Between California's energy shortages and rapidly escalating electricity costs, home-buyers will be including energy efficiency at the top of their list of preferred amenities. Summer Performance Houses use less energy than the average house. Depending on how they are built (for example, with certified lumber), they can be classified as Green, creating a great marketing opportunity. As designed they will comply with all energy codes. The prototype houses also can comply with California state and utility programs, such as PG&E's Comfort Home and EPA's Energy Star. These programs deliver a marketing edge and incentives, thereby increasing value to the builder.

**** Reduced power demand on the utilities*** Title 24 , our energy code, keeps home energy consumption within reasonable limits, , but does not necessarily provide comfortable interiors during hot summer days. As a result, air conditioning is being installed, even in houses built near the coast. Houses with large air conditioners that are used only on the hottest days put the worst kind of stress on the local utility. Residential air conditioning in areas of new residential growth is one of the least cost-effective electrical loads to serve. Residential utility rates are adversely impacted by the high generation, distribution, and transmission capacity development costs to serve summer peak loads. Managing the air conditioning load will have far-reaching impacts on the ability of utilities to continue to serve new developments in this rapidly growing state.

**** Lower risk through improved comfort and better ventilation and comfort*** Solid construction coupled with well-engineered comfort systems that regularly ventilate the house with filtered fresh outside air will reduce customer complaints about comfort, mold, and allergic reactions to new building materials. Superior summer and winter comfort and quiet operation will convey a feeling of quality to the buyer.

**** Plans, financial and technical support are available*** The prototype house designs, including full architectural drawings and specifications, structural designs, and mechanical designs are available from the Davis Energy Group and Loisos+Ubbelohde. Plans need only to be adapted to specific site and location criteria and are otherwise ready for permitting. We offer both expertise and financial support to the builder to prepare the designs for construction, as well as assistance in commissioning and training homeowners on operation of the house after construction.

MARKET FEATURES OF THE SUMMER PERFORMANCE HOUSES

The three houses offered in this package are designed to be attractive to California residential customers and the building industry in terms of design features and cost. Our goal is to effect performance improvements in the houses that are already the backbone of the residential market, not to change the type or look of proven house designs in the name of conserving energy. The design of these houses offer premium amenities and features:

* ***A Solid House.*** The construction of the house feels solid. The prospective homeowner will appreciate the permanent feel of the house.
* ***A Healthy House.*** In summer and winter the mechanical system ventilates the house with filtered outdoor air, removing allergens, VOC's, carbon dioxide, and household odors. In addition, the finishes of the house are designed to reduce the most common sources of allergies.
* ***A Cool Interior.*** Night ventilation keeps the house cool most days, creating a more comfortable environment without the high cost of operating an air conditioner.
* ***A Secure House.*** Ventilation systems provided with these designs do not require windows to be opened to obtain fresh air. This means owners can leave the house knowing it is secure and that they will be returning to a well ventilated, comfortable environment.
* ***Sound Walls.*** The construction of the house will provide a quieter interior. Parents will be able to retreat while their children enjoy their music, video games and such.
* ***Increased Fire Safety.*** The walls provide increased fire separation within the house. The walls are built to commercial one-hour fire separation levels.
* ***Porches.*** All designs offer real porches that provide outdoor sitting areas connected to the living room with eyes on the street.
* ***Large Spaces and High Ceilings.*** The house designs offer large ceiling heights in the common areas with vistas creating a spacious feeling.
* ***Modern Large Master Bedroom Suites.*** All designs offer large spaces for the homeowners and include walk in closets and large bathrooms.
* ***Modern Amenities.*** All designs have spaces for Media Centers to allow the most current home entertainment systems.
* ***Fireplaces.*** All designs have fireplaces in the great rooms to increase the warmth and comfort of the family center.
* ***Hidden Garages*** (in most design options). Both homeowners and local planning officials will appreciate the lack of garage doors on the street side elevation.

TWO-STORY SIDE COURT HOUSE

Figure 1 Street Side Elevation - Two Story House

A two story, single-family detached house on a standard size lot with 3 bedrooms, 1 bonus room (office/bedroom), 3 bathrooms, and a three car garage.

	Detached Garage	Attached Garage
Lot Size (approx):	~6,000 sf	~5,000 sf
First Floor Area:	1,349 sf	1,310 sf
Second Floor Area:	1,033 sf	1,092 sf
Total:	2,382 sf	2,401 sf

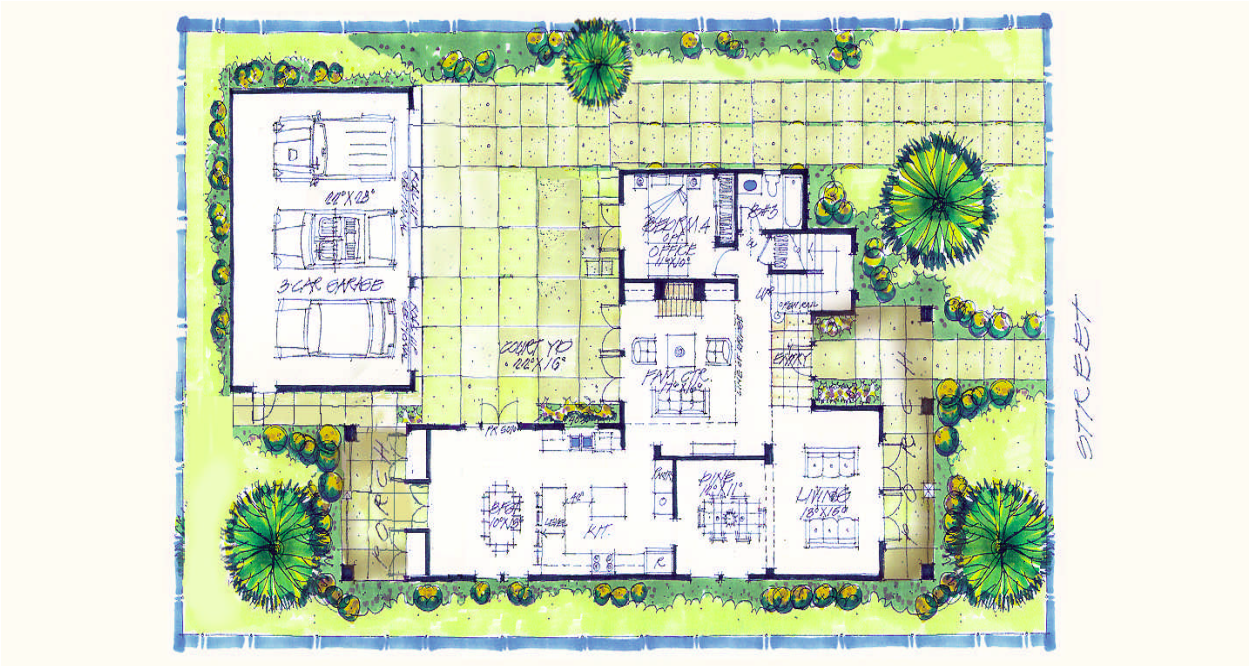


Figure 2. Two Story House Street Access - Rendered plan of ground floor and site conditions

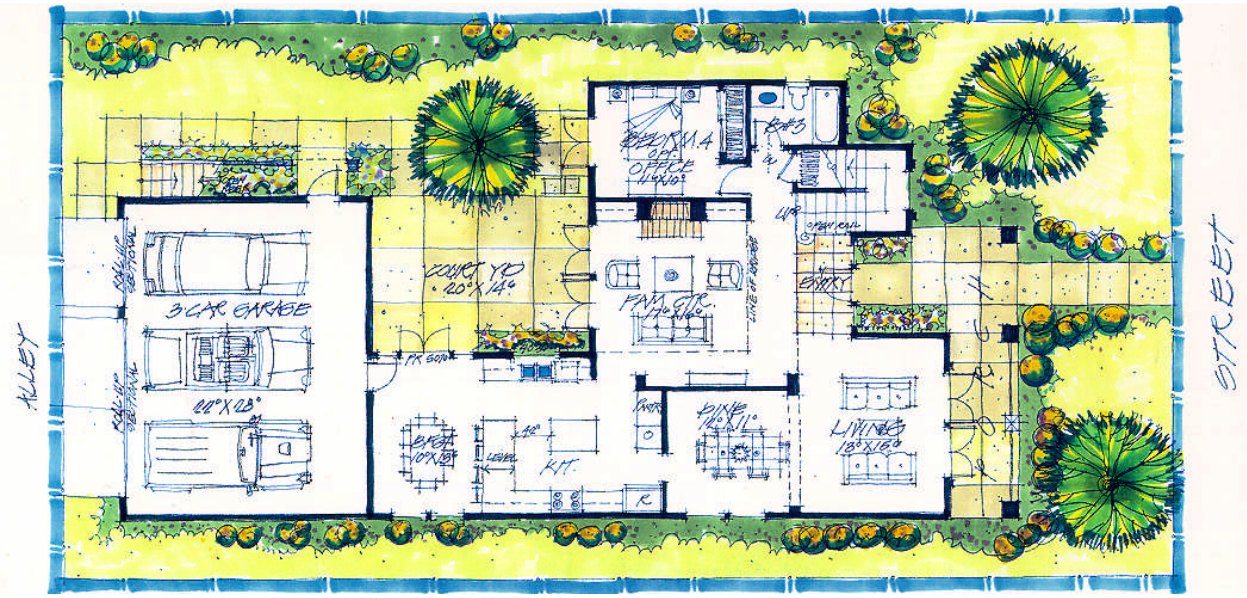


Figure 3. Two Story House Alley Access - Rendered plan of ground floor and site conditions

- front porch and windows onto the street bring back traditional street relationship
- front porch entry off the street into a double height entry space
- view from entry through to the shaded courtyard
- formal living room with double French doors onto a porch
- double-height great room with media wall, and fireplace
- kitchen with breakfast nook facing onto the shaded courtyard
- paved and shaded courtyard accessible from kitchen and great room is
- french doors open into a protected courtyard
- additional room with bath serves as fourth bedroom, home office or in-law suite
- upstairs laundry center easily accesible to bedrooms

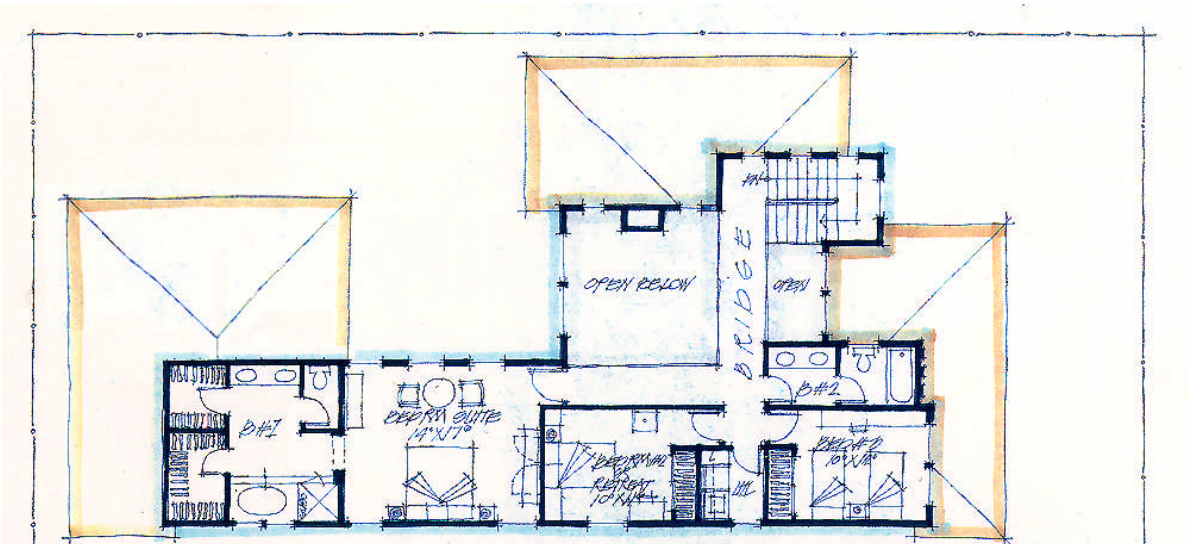


Figure 4. Two Story House - Rendered plan of upper floor

SINGLE-STORY FORE COURT HOUSE.

Figure 5. Street Side Elevation - Single Story Forecourt House

A single story, single-family detached house on a standard size lot with 3 bedrooms, 2 bathrooms and a two car garage accessible by a court on the front of the house.

Lot Size: 5,400 sf Floor Area: 1,998 sf

- front entrance off court serves as formal entry and driveway to the garage.
- formal living room and dining room connected to front porch
- dining area provides expansive view from entry to back garden
- high volume great room, kitchen and breakfast nook areas give onto back garden through French doors
- great room features fireplace and media wall
- private bedroom area separated from living room by tech center and linen closet
- tech center provides place for homework and home office activities
- double doors lead into master bedroom suite featuring walk-in closet and large bathroom

Figure 6. Single Story Forecourt House - Rendered plan and site conditions

SINGLE-STORY COMPACT HOUSE

Figure 7. Street Side Elevation - One Story House

A compact single story, single-family detached house on a standard size lot with 3 bedrooms, 2 bathrooms, a two car garage accessible by a standard driveway on the front of the house.

Lot Size : 5,400 sf Floor Area: 1,762 sf

- compact design especially appropriate for hotter inland valley climates
- high ceilings throughout the spacious and formal living/dining rooms
- long views through the house give spacious feel
- kitchen, breakfast nook and great room connect directly to the back yard through double French doors
- high volume great room creates family realm with media wall and fireplace adjacent to kitchen and nook
- master bedroom suite is separated from the children's bedroom area

Figure 8. Street Side Elevation - One Story House

ENERGY FEATURES OF THE SUMMER PERFORMANCE HOUSES

The Summer Performance Houses rely on both construction features and the mechanical system to provide performance and comfort. An improved building shell, thermal mass, high performance windows, and an advanced mechanical system are integrated to provide superior summer performance.

CONSTRUCTION FEATURES

* ***Roof.*** Roof insulation is R38; truss construction accommodates higher insulation levels if desired. Roof sheathing with a laminated reflective barrier (Louisiana Pacific TechShield) is used in warmer climates.

* ***Windows.*** The windows specified comply with the new Title 24 requirements. Their performance is equal to or better than Milgard PPG Sungate 1000. They provide a U-value of 0.31 or lower, a Solar Heat Gain Factor of 0.37 or lowe, and a Visible transmission of 0.6 or higher.

* ***Shading.*** Traditional elements such as overhangs, porches and trellises are included in the Summer Performance Houses. These offer both marketing and shading benefits, improving summer performance.

* ***Infiltration.*** The tightness of the building envelope is similar to a moderately tight house with a specific leakage area (SLA) of 3.9 or less.

* ***Walls.*** House thermal mass is increased by applying 5/8" gypsum wallboard to all walls. The massive walls absorb more heat, resulting in more moderate indoor temperatures. The heavier walls make the house feel more substantial, as well as improving sound insulation and fire safety. The walls are insulated with R15 fiberglass batt between the 2 x 4 studs. An exterior air barrier is used to reduce infiltration. Additional insulation external to the studs such as "Tuff-R", or an insulation-based stucco lathe is used to reduce heat conductance through studs.

* ***Floors***. The concrete slab, which also contributes thermal mass, is covered with stone or tile to facilitate absorption of heat by the floor. Plans show tile floors covering 50% of the ground floor. To minimize heat gain and loss with the outside slab edge, insulation is specified.

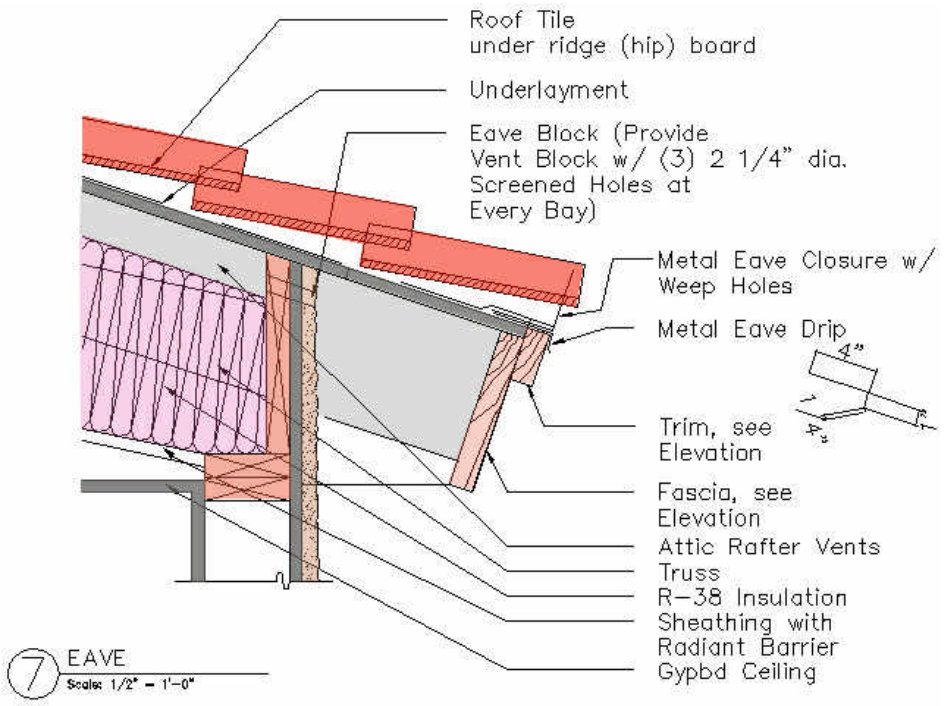


Figure 9. Typical Eave Detai

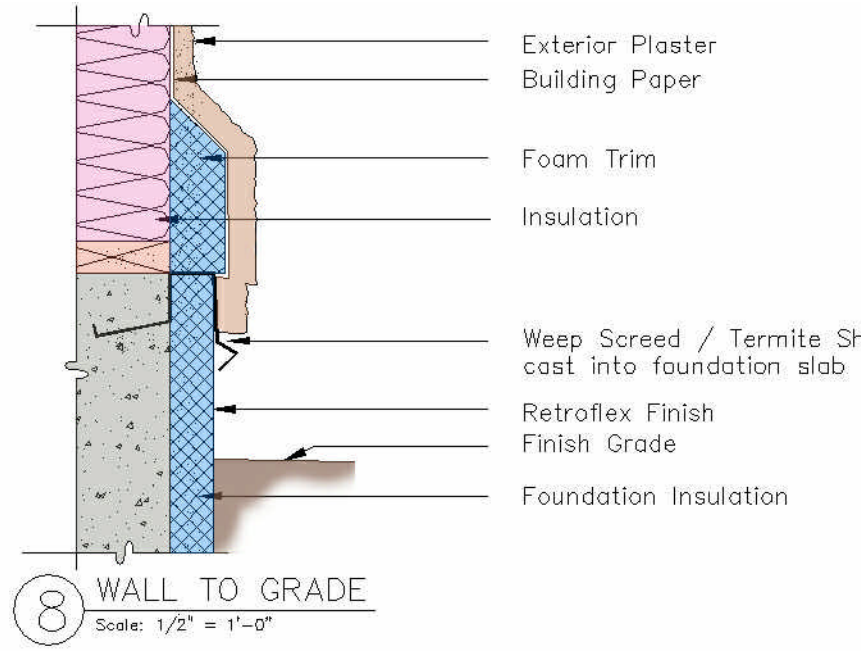


Figure 10. Typical Wall to Grade Detail

MECHANICAL SYSTEMS.

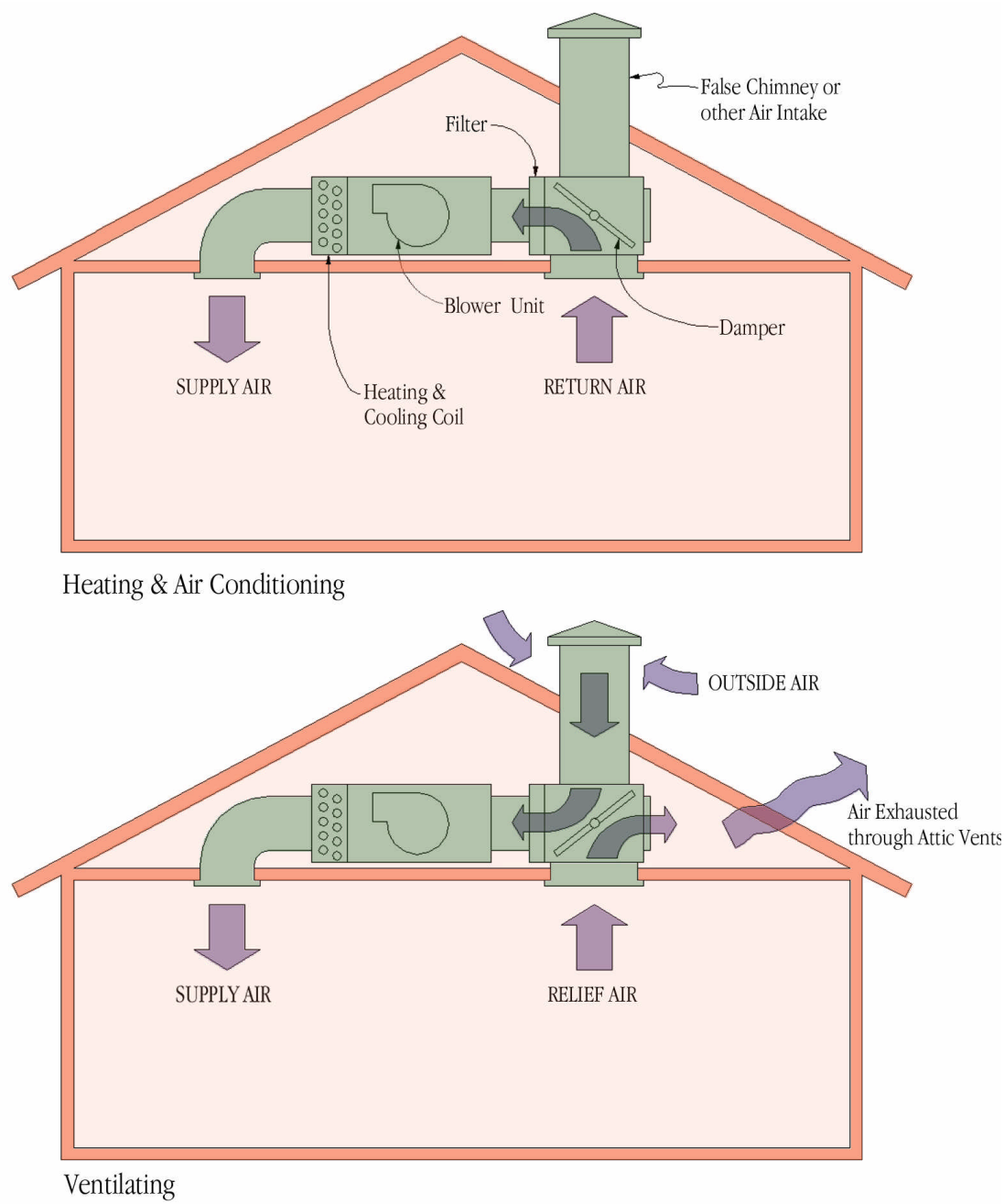


Figure 11. Schematic diagrams of the “Smart Mechanical System” in two operating modes

The Summer Performance houses are designed to require less cooling than current production houses. This allows air conditioners to be smaller than typical and means air conditioners can be eliminated in some climates. Cooling is primarily provided using nighttime ventilation and storage of "coolth" in the building mass.

The mechanical system offers the following features:

* Variable speed hot water furnace delivers heating efficiently and quietly
* Location of ducts inside the building envelope improves efficiency
* High recovery water heater efficiently heats the house and domestic hot water
* Outside air damper provides ventilation cooling on summer nights and fresh air in the winter
* Controls integrate all functions and predict indoor summer temperatures based on user settings

The "NightBreeze" heating-cooling-ventilation system is manufactured by Enviromaster International of Rome, NY and was developed with support from the California Institute for Energy Efficiency and the California Energy Commission. The system has been thoroughly laboratory and field-tested. See the NightBreeze brochure for more details.

COMFORT AND PERFORMANCE

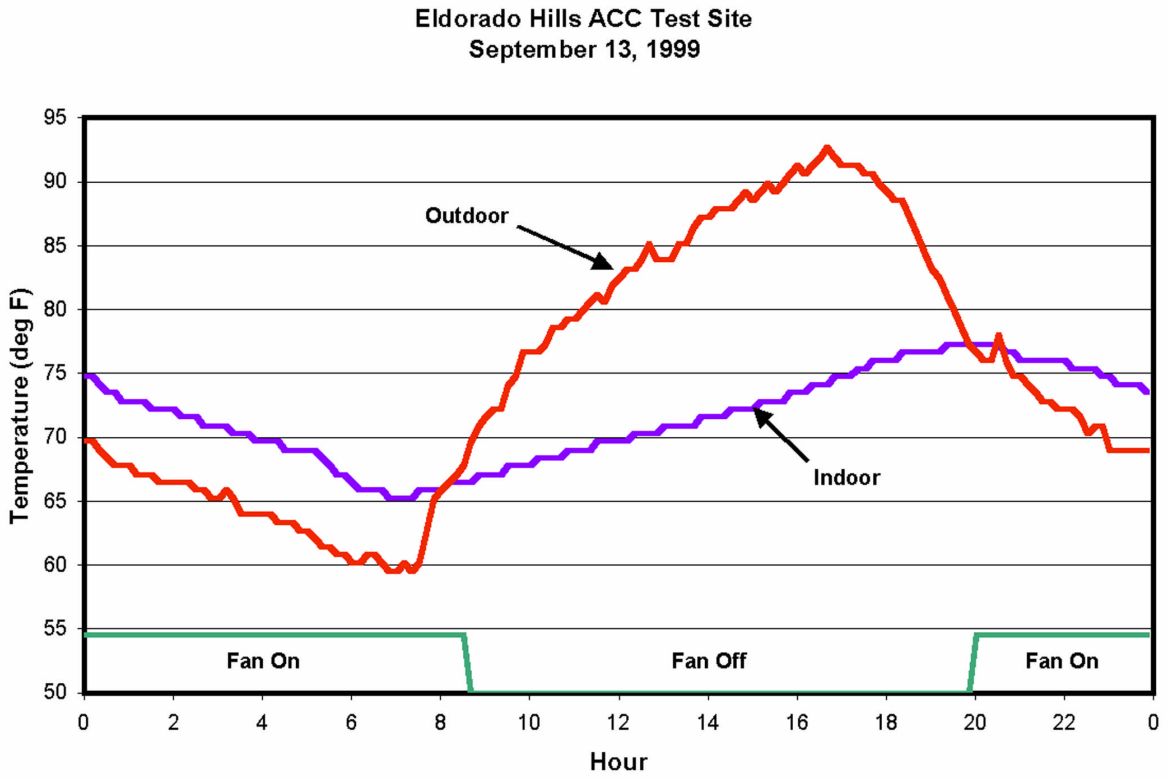
Available thermostats are not capable of integrating ventilation cooling, heating, and air conditioning. A collaborative of manufacturers, engineers, architects and social scientists worked to develop a control system that would provide this integration while effectively conveying the concepts of ventilation cooling to the homeowner. The thermostat includes a large LCD screen that displays different information depending on what settings are being made (heating, cooling, etc.).

The figure below shows the "Long Term" cooling settings screen, and shows how the thermostat allows the owner to make two temperature settings for controlling ventilation cooling and air conditioning. The "Low" setting indicated above the horizontal "comfort bar" is the lowest temperature to which the house will be cooled by ventilation, and the "Hi" setting is the maximum desired temperature and also the temperature at which the air conditioner will run. The shaded portion of the bar indicates the predicted range of indoor temperatures for the next day and changes as the low and high temperature settings are changed. If the shaded bar crosses the "Hi" setting, a message is displayed that indicates "Air Conditioner Will Run".

The thermostat is produced by a California controls manufacturer and uses software developed specially for the Summer Performance House

The summer comfort target recommended by the Air Conditioning Contractors of America (ACCA) manual is 78 degrees plus or minus 3 degrees F. The three houses have been designed to achieve this level of comfort or better. Additional comfort is provided by ceiling fans located in primary rooms.

The graph below shows the application of this system in an existing house. By using electrical energy to ventilate the house during non peak times the house maintains comfort without the cold drafts of refrigerated air. Even when the outside temperature peaks at 92° the interior stays below 78°. By not using an airconditioner during the hottest time of the day these houses do not contribute to the peak demand problems faced by the State.



Monitored performance in a existing house with the prototype controller / thermostat and some of the architectural and mechanical features of the Summer Performance House

Beyond maintaining the interior temperature, Summer Performance houses will deliver more pleasing comfort than an air-conditioned Title 24 house. Summer cooling that relies on conventional air conditioning often is accompanied by much warmer temperatures on the second floor of two-story houses, drafts and noise. In contrast, cool wall and floor surfaces of the Summer Performance house will surround the occupants , providing even comfort throughout the house. When the air conditioner does run there will be less noise from ducts because the air conditioner can be much smaller.

APPLICABILITY

Computer studies indicate that the Summer Comfort House designs can be kept comfortable just by using ventilation cooling in large areas of California. In much of the rest of the state, a small 1-1/2 ton air conditioner will maintain comfort. Only the hottest locations require air conditioner compressors larger than 1-1/2 tons. These will still be smaller than compressors in conventional houses in the same regions. Summer performance houses can reduce summer and peak electrical demand throughout the State of California by eliminating or substantially reducing the air-conditioning load.

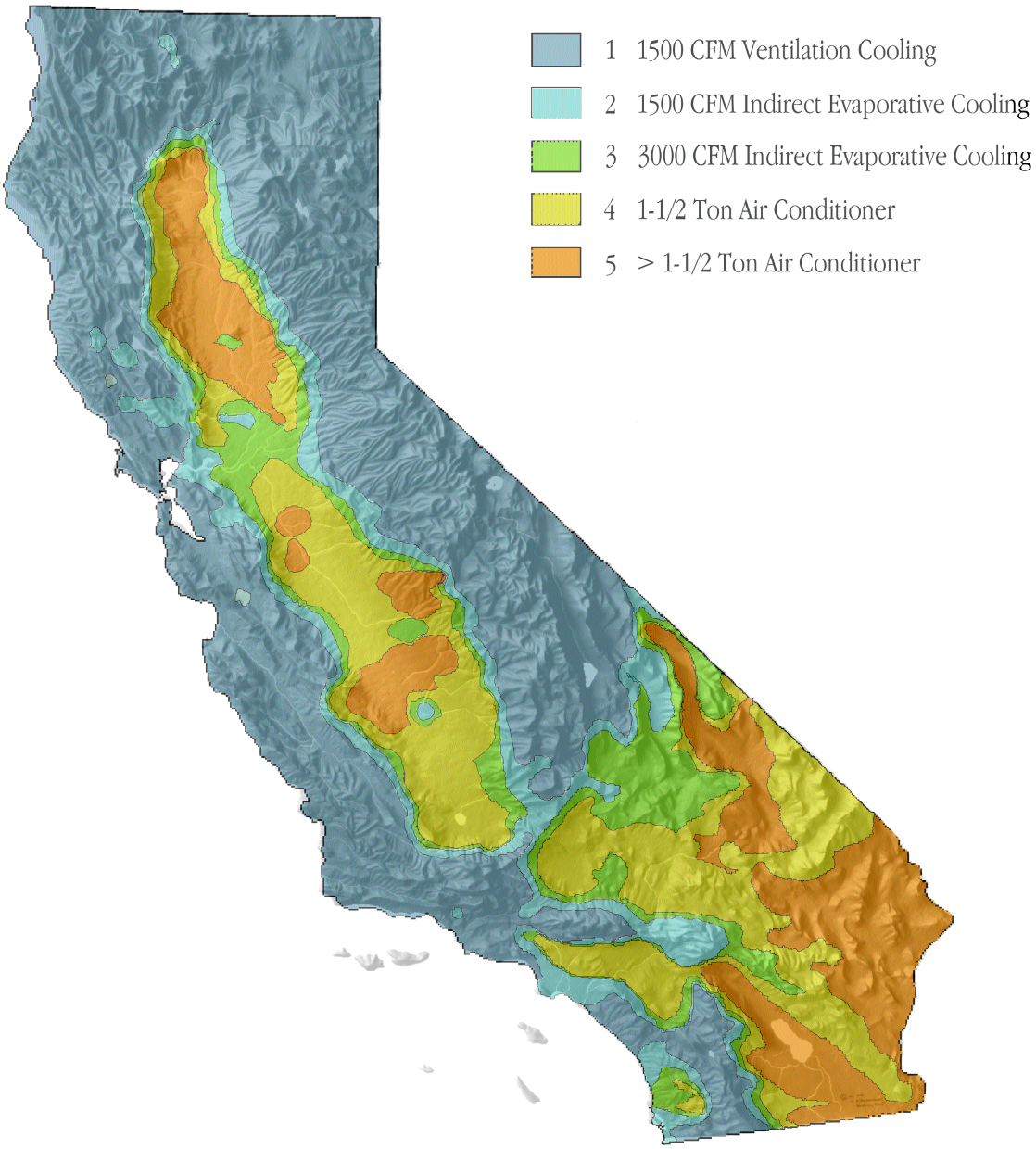


Figure 15. General range of Applicability for different Cooling Systems associated with the Summer Comfort Houses

All ideas, designs, arrangements and plans indicated or represented by these drawings where created, evolved and developed by Loisos/Ubbelohde and the Davis Energy Group (DEG) under contract to the California Institute for Energy Efficiency (CIEE) and subsequently under a Public Interest Energy Research (PIER) contract with the California Energy Commission (CEC). Structural design was developed by Horowitz Taylor Engineering under contract to Loisos/Ubbelohde.

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